



**PACS “AS\_VIMeN”™**

**DICOM 3.0 Conformance Statement**

**Course-AS1.Ltd**

Moscow 2007

## SECTION A. CONFORMANCE STATEMENT

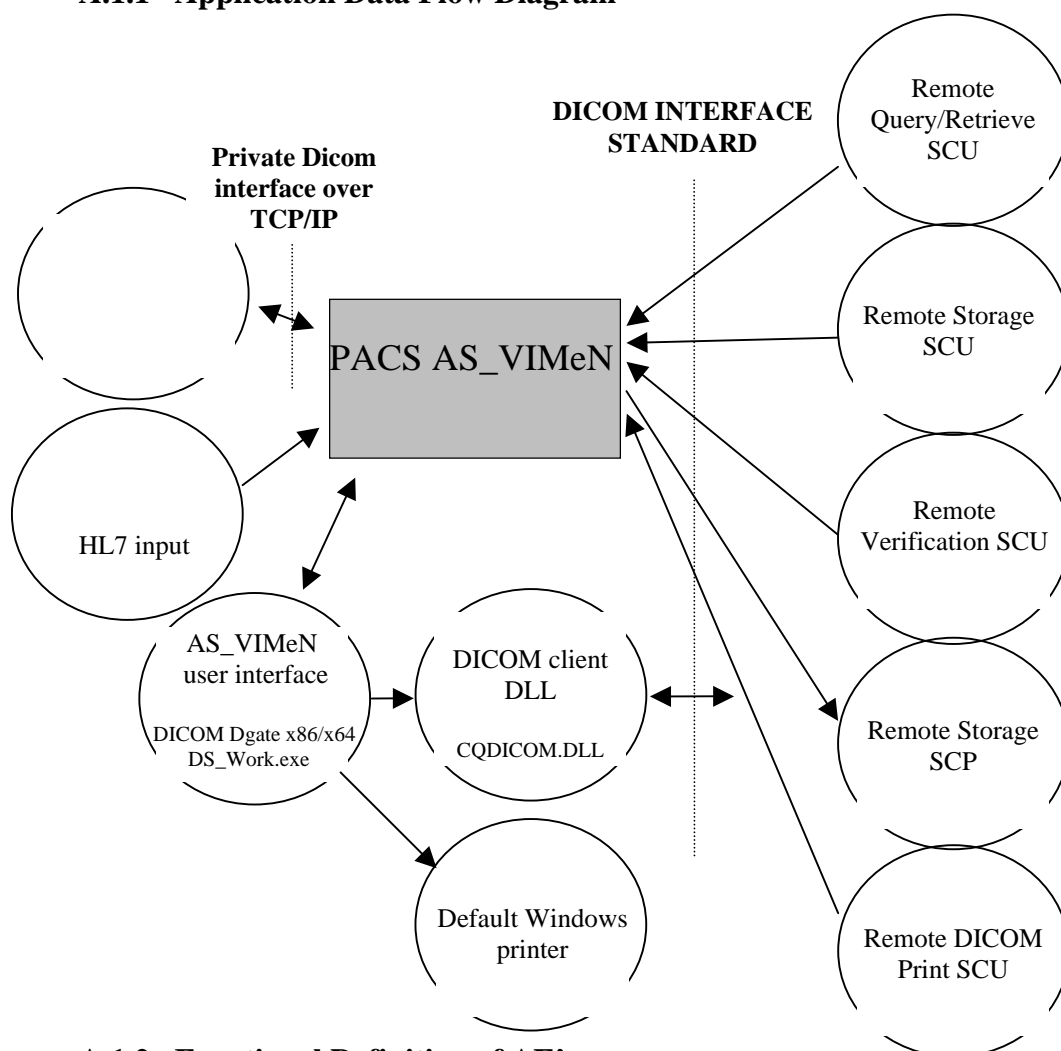
### A.0 INTRODUCTION

This conformance statement (CS) details the PACS "AS\_VIMeN" compliance to DICOM v3.0. It covers all DICOM Service Class roles in this product:

- Various Storage Service Class (SCP) Roles
- Morphing Storage Service Class (SCU) Roles
- Patient Root Query & Retrieve (SCP) Roles
- Study Root Query & Retrieve (SCP) Roles
- Patient/Study Root Query & Retrieve (SCP) Roles
- Verification Service Class (SCP) Role
- Print Management (SCP) Role
- Worklist Query (SCP) Role

### A.1 IMPLEMENTATION MODEL

#### A.1.1 Application Data Flow Diagram



#### A.1.2 Functional Definition of AE's

This Application Entity provides Standard Conformance to the following DICOM v3.0 SOP Classes as an SCU:

SOP Class Name	SOP Class UID
Verification (Echo)	1.2.840.10008.1.1
* Unknown IOD Storage	* See note

**NOTE:** This PACS will initiate outgoing DICOM C-STORE requests masquerading as any stored IOD module. The behavior of this outgoing association link will be like the DICOM defined SCU role: Storage Service Class.

This Application Entity provides Standard Conformance to the following DICOM v3.0 SOP Classes as SCP:

SOP Class Name	SOP Class UID
Verification (Echo)	1.2.840.10008.1.1
Patient Root Query/Retrieve Info. Model -FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Info. Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Info. Model -FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Info. Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Patient Study Only Query/Retrieve Info. Model -FIND	1.2.840.10008.5.1.4.1.2.3.1
Patient Study Only Query/Retrieve Info. Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18
Modality WorkList Query	1.2.840.10008.5.1.4.31
* Unknown IOD Storage	* See note

**NOTE:** This PACS will accept any incoming DICOM C-STORE request sent using the DICOM defined SCP role: Storage Service Class. The d Gatesop.lst file (see configuration section and dicom.ini file) can be used to selectively restrict this ability.

### A.2.1.1 Association Establishment Policies

#### A.2.1.1.1 General

The DICOM Application Context Name (ACN) that is always proposed is:

<b>Application Context Name</b>	<b>1.2.840.10008.3.1.1</b>
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The Maximum Length PDU negotiation is included in all association establishment requests. The maximum length PDU for an association initiated by the NetMain AE is:

<b>Maximum Length PDU</b>	<b>16Kbytes</b>
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The SOP class Extended Negotiation is not supported and ignored.

There is no limit on the maximum number of Presentation Contexts Items that will be proposed. In this implementation, each Abstract syntax will be proposed with either a single Transfer Syntax, or with a few JPEG transfer syntaxes, depending on the configuration in *acrnema.map*.

The user info items sent by this product are:

- Maximum PDU Length
- Implementation UID
- Implementation Version

**Note:** Max PDU length is not configurable at run time.

#### **A.2.1.1.2 Number of Associations**

PACS Main AE will initiate one DICOM association to perform image store for each concurrently incoming C-MOVE request.

There is no artificial maximum placed on the number of simultaneous DICOM associations open at one time. It should be noted that system response time will be degraded, and this could possibly adversely effect a time-out period on other remote AE's.

The Print Management function will correctly handle multiple simultaneous associations, but the elementary print support in the AS\_VIMeN user interface will not correctly print (i.e., images on the pages will be mixed up) when multiple print jobs are sent simultaneously.

#### **A.2.1.1.3 Asynchronous Nature**

Asynchronous mode is not supported. All operations will be performed synchronously.

#### **A.2.1.1.4 Implementation Identifying Information**

The Implementation UID allows unique identification of a set of products that share the same implementation.

The Implementation UID for this ID/Net v3.0 Implementation is:

<b>Storage &amp; Q/R UID</b>	<b>1.2.826.0.1.3680043.2.135.1066.101</b>
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#### **A.2.1.2 Association Initiation by Real-World Activity**

##### **A.2.1.2.1 Proposed Presentation Contexts**

Presentation Context Table – Proposed					
Abstract Syntax & configuration		Transfer Syntax		Role	Expanded Negotiation
*Unknown	un,as,n1..n4, uj,nj	Little Endian	1.2.840.10008.1.2	SCU	None

*Unknown	j3..j6	JPEGBaseLine1	1.2.840.10008.1.2.4.50	SCU	None
*Unknown	j3..j6	JPEGExtended2and4	1.2.840.10008.1.2.4.51	SCU	None
*Unknown	j5	JPEGSpectralNH6and8	1.2.840.10008.1.2.4.53	SCU	None
*Unknown	j6	JPEGFullInNH10and12	1.2.840.10008.1.2.4.55	SCU	None
*Unknown	j2	JPEGLosslessNH14	1.2.840.10008.1.2.4.57	SCU	None
*Unknown	j1, j2	JPEGLossless	1.2.840.10008.1.2.4.70	SCU	None

**Note:** Due to the morphing nature of the outgoing SSC-SCU engine, the specific Abstract Syntax that is proposed depends upon the nature of the stored image. The actual proposed Transfer Syntaxes depend on the configuration in *acrnama.map* and are the same for each class of stored images.

#### **A.2.1.2.1.2 SOP Specific Conformance Statement for Image Storage SOP Class**

This implementation can perform multiple C-STORE operations over a single association.

Upon receiving a C-STORE confirmation containing a successful status, this implementation will perform the next C-STORE operation. The association will be maintained.

Upon receiving a C-STORE confirmation containing an Error, Refused or Warning status, this implementation will fail the specific IOD in question. If more images need to be sent, they will be sent in the same association.

#### **A.2.1.2.2 Association Acceptance Policy**

##### **A.2.1.2.2.1 Real-World Activity**

This AE accepts associations for the Query/Retrieve (Q/R) SOP using the Patient Root, Study Root, and Patient/Study Only Query Model.

This AE accepts associations for the Image Storage Class using any defined IOD class.

This AE accepts associations for the Verification Service Class.

This AE accepts associations for the Print Service Class.

This AE accepts associations for the WorkList Query Service Class.

##### **A.2.1.2.2.2 Real-World Activity**

This AE is indefinitely listening for Q/R, Storage Class, Verification and Print Management associations

##### **A.2.1.2.2.3 Proposed Presentation Contexts**

Presentation Context Table – Accepted					
Abstract Syntax		Transfer Syntax		Role	Expanded Negotiation
Patient Root Query/Retrieve	1.2.840.10008.5.1.4.1.2.1.1	Little Endian	1.2.840.10008.1.2	SCP	None

Info. Model – FIND					
Patient Root Query/Retrieve Info. Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Query/Retrieve Info. Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Query/Retrieve Info. Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Little Endian	1.2.840.10008.1.2	SCP	None
Patient/Study Only Query/Retrieve Info. Model – FIND	1.2.840.10008.5.1.4.1.2.3.1	Little Endian	1.2.840.10008.1.2	SCP	None
Patient/Study Only Query/Retrieve Info. Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Little Endian	1.2.840.10008.1.2	SCP	None
Modality WorkList Query	1.2.840.10008.5.1.4.31	Little Endian	1.2.840.10008.1.2	SCP	None
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Little Endian	1.2.840.10008.1.2	SCP	None
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Little Endian	1.2.840.10008.1.2	SCP	None
*Unknown	*Unknown	Little Endian*	1.2.840.10008.1.2	SCP	None
Verification	1.2.840.10008.1.1	Little Endian	1.2.840.10008.1.2	SCP	None

**Note:** Due to the morphing nature of the incoming SSC-SCP engine, the specific Abstract Syntax accepted will depend upon the nature of the stored image, and the *d gatesop.lst* configuration file (of which a default version is automatically created when installing the DICOM server).

\*The server can accept many transfer syntaxes as configurable by *d gatesop.lst*.

#### **A.2.1.2.2.4 SOP Specific Conformance for Query/Retrieve FIND SOP Class SCP**

The C-FIND response status values are supported as defined in DICOM v3.0 Part 4.

All Required (R) and Unique (U) Study, Series, and Image Level Keys for the Patient Root, Study Root, and Patient/Study Only Query/Retrieve Information Model are supported. Many optional (O) Keys are supported, as described later in this document.

#### **A.2.1.2.2.5 SOP Specific Conformance for Query/Retrieve MOVE SOP Class SCP**

Prioritization of C-FIND & C-MOVE requests is all set to normal - 0.

All images requested in a single C-MOVE will be sent over a single association (the association will not be re-established for each image).

### A.2.1.2.2.6 SOP Specific Conformance for “Unknown” Storage SCP

The specific Storage SCP classes accepted are programmable (by the user) at runtime, and cannot be explicitly stated here.

No optional elements are discarded.

The duration of the storage is temporary. Least recently added patients are deleted when the disk space is less than the amount specified in the “Cleanup disk space below (MB)” field in the DICOM server. This amount is run-time configurable. When the DICOM server is connected to a, e.g., jukebox archival system, the duration of storage can be made permanent.

### A.2.1.2.2.7 Presentation Context Acceptance Criterion

No criterion.

### A.2.1.3 Transfer Syntax Selection Policies

The server can accept most transfer syntaxes as configurable by *dgatesop.lst*. Outgoing connections can be made over uncompressed, loss-less or lossy JPEG transfer syntaxes. If so, the images are recompressed to conform to the accepted transfer syntax. The configuration is done through *acrnama.map*.

Configuration	Proposed transfer syntaxes	Name
un <sup>1</sup> , as <sup>2</sup> , n1..n4 <sup>3</sup> , nj <sup>4</sup> , uj <sup>4</sup>	1.2.840.10008.1.2	ImplicitLittleEndian
j1	1.2.840.10008.1.2.4.70	JPEG Lossless sv1
	1.2.840.10008.1.2	ImplicitLittleEndian
j2	1.2.840.10008.1.2.4.57	JPEG Lossless sv 6
	1.2.840.10008.1.2.4.70	JPEG Lossless sv1
	1.2.840.10008.1.2	ImplicitLittleEndian
j3, j4	1.2.840.10008.1.2.4.51	JPEG extended (12 bits)
	1.2.840.10008.1.2.4.50	JPEG baseline (8 bits)
	1.2.840.10008.1.2	ImplicitLittleEndian
j5	1.2.840.10008.1.2.4.53	JPEG spectral selection
	1.2.840.10008.1.2.4.51	JPEG extended (12 bits)
	1.2.840.10008.1.2.4.50	JPEG baseline (8 bits)
	1.2.840.10008.1.2	ImplicitLittleEndian
j6	1.2.840.10008.1.2.4.55	JPEG progressive
	1.2.840.10008.1.2.4.51	JPEG extended (12 bits)
	1.2.840.10008.1.2.4.50	JPEG baseline (8 bits)
	1.2.840.10008.1.2	ImplicitLittleEndian

**Note:** The transfer syntaxes are listed in order of priority. I.e., if a host is configured as j1 and it accepts JPEG lossless, the image will be lossless JPEG compressed before transmission, even if it was not stored in that way.

- 1) un = uncompressed. Images will be decompressed prior to transmission.
- 2) The configuration “as” will transmit images as-is. Independent of how images are stored on disk (with JPEG or NKI compression), they will be

transmitted over an ImplicitLittleEndian connection. This behavior does not conform to the DICOM standard and for many hosts this may therefore not work. NKI clients will work, though.

3) Configurations n1..n4 will transmit images with NKI private compression, which can only be read by NKI clients.

4) nj = nki compressed, leave jpeg as is; uj = uncompressed, leave jpeg as is

### **A.3. COMMUNICATION PROFILES**

#### **A.3.1 Supported Communication Stacks (parts 8,9)**

DICOM Upper Layer (Part 8) is supported using TCP/IP.

#### **A.3.2 OSI Stack**

OSI stack not supported.

#### **A.3.3 TCP/IP Stack**

The TCP/IP stack is inherited from the Windows operating System.

We have used the excellent Delphi/C++ TCP/IP components from PACS AS\_VIMeN user interface.

#### **A.3.3.1 API**

#### **A.3.3.2 Physical Media Support**

Any Windows supported physical media.

#### **A.3.4 Point-to-Point Stack**

A 50 pin ACR-NEMA connection is not supported.

### **A.4. EXTENSIONS / SPECIALIZATION / PRIVATIZATIONS**

VR (0x7fdf, 0x0010) contains compressed pixel data if NKI compression is used. In the normal configuration, the server will never transmit NKI compressed data, but will compress and decompress the data on the fly. The following presentation contexts have been added to allow NKI private compressed data to be transmitted and to allow retrieval of downsized images for higher speed:

1.2.826.0.1.3680043.2.135.1066.5.1.4.1.2.1.2	PatientRootRetrieveNKI
1.2.826.0.1.3680043.2.135.1066.5.1.4.1.2.2.2	StudyRootRetrieveNKI
1.2.826.0.1.3680043.2.135.1066.5.1.4.1.2.3.2	PatientStudyOnlyRetrieveNKI

These contexts contain sub-classed versions of the standard C-MOVE commands with the following additional optional control parameters (numbers are hexadecimal):

(9999, 0100): MaxVrSize	Do not send VRs larger than this number of bytes
(9999, 0200): MaxRowsColumns	Downsize image to maximal this #rows and columns
(9999, 0201): Frame	If given, return only the selected frame of a MF object
(9999, 0300): ConsoleText	Text will be printed to server console
(9999, 0400): Silent	If sent, console does not log transaction



(9999, 0500): MaxSlices  
(9999, 0600): MaxCompression  
(9999, 0700): Recompression

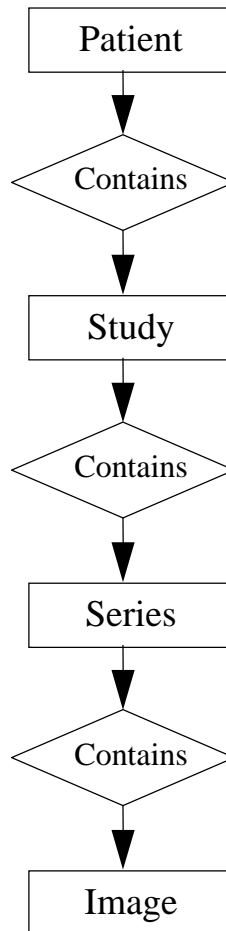
Also used internally by GUI and WEB interface  
Send at most # slices irrespective of query result  
Maximum supported compression by NKI client (default 4)  
Recompress style NKI or JPEG (default none)

### **SECTION 3 DEFAULT QUERY/RETRIEVE INFORMATION MODEL DEFINITION**

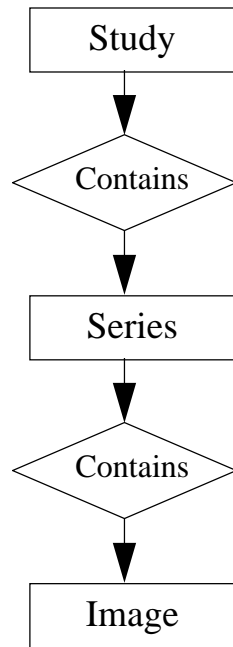
This section describes the subset of the DICOM v3.0 Patient Root, Study Root, and Patient/Study Only, Query/Retrieve Information Model Definition used by this product.

#### **3.0 INTEROPERABILITY SCHEMA**

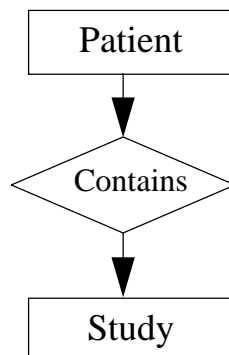
##### **3.0.1 PATIENT ROOT QUERY/RETRIEVE ENTITY RELATIONSHIP**



### 3.0.2 STUDY ROOT QUERY/RETRIEVE ENTITY RELATIONSHIP



### 3.0.3 PATIENT/STUDY ONLY QUERY/RETRIEVE ENTITY RELATIONSHIP



### 3.1 ENTITY DESCRIPTIONS

See DICOM Standard Part 4

## 3.2 PATIENT ROOT QUERY/RETRIEVE INFORMATION OBJECT DEFINITION

### 3.2.1 Patient Level Keys for Patient Root Query/Retrieve Information Model

Attribute Name	Element Tag	Type	Notes
Revision: 10 (plus computed items)			
Patient Name	(0010,0010)	R	
Patient ID	(0010,0020)	U	
Patient Birth Date	(0010,0030)	O	
Patient Sex	(0010,0040)	O	
Number of Patient Related Studies	(0020,1200)	O	Computed* - not database
Number of Patient Related Series	(0020,1202)	O	Computed* - not database
Number of Patient Related Instances	(0020,1204)	O	Computed* - not database

\*requires setting EnableComputedFields = 1 in dicom.ini

### 3.2.2 Study Level Keys for Patient Root Query/Retrieve Information Model

Attribute Name	Element Tag	Type	Notes
Revision: 17 (plus computed items)			
Study Instance UID	(0020,000D)	U	
Study Date	(0008,0020)	R	
Study Time	(0008,0030)	R	
Study ID	(0020,0010)	R	
Study Description	(0008,1030)	O	
Accession Number	(0008,0050)	O	
Referring Physician	(0009,0090)	O	
Patients Age	(0010,1010)	O	
Patients Weight	(0010,1030)	O	
Study Modality	(0008,0061)	O	Multiple entry item, automatically updated by server
Number of Study Related Series	(0020,1206)	O	Computed* - not database
Number of Study Related Instances	(0020,1208)	O	Computed* - not database

\*requires setting EnableComputedFields = 1 in dicom.ini

### 3.2.3 Series Level Keys for Patient Root Query/Retrieve Information Model

Attribute Name	Element Tag	Type	Notes
Revision: 17 (plus computed items)			
Series Instance UID	(0020,000E)	U	
Series Number	(0020,0011)	R	
Series Date	(0008,0021)	R	

Series Time	(0008,0031)	R	
Series Description	(0008,103E)	O	
Modality	(0008,0060)	O	
Station Name	(0008,1010)	O	
Institution	(0008,0080)	O	
Patient Position	(0018,5100)	O	
Contrast Bolus Agent	(0018,0010)	O	
Manufacturer	(0008,0070)	O	
Model Name	(0008,1090)	O	
Body Part Examined	(0018,0015)	O	
Protocol Name	(0018,1030)	O	
Frame of Reference UID	(0020,0052)	O	Computed* - not database
Number of Series	(0020,1209)	O	
Related Instances			

\*requires setting EnableComputedFields = 1 in dicom.ini

### 3.2.4 Image Level Keys for Patient Root Query/Retrieve Information Model

Attribute Name	Element Tag	Type	Notes
Revision: 13			
SOP Instance UID	(0008,0018)	U	
SOP Class UID	(0008,0016)	O	
Image Number	(0020,0013)	O	
Image Date	(0008,0023)	O	
Image Time	(0008,0033)	O	
Echo Number	(0018,0086)	O	Multiple entry item
Number Of Frames	(0028,0008)	O	
Acq Date	(0008,0022)	O	
Acq Time	(0008,0032)	O	
Receiving Coil	(0018,1240)	O	
Acq Number	(0020,0012)	O	
Slice Location	(0020,1041)	O	
Samples Per Pixel	(0028,0002)	O	
Photometric Interpret.	(0028,0004)	O	
Rows	(0028,0010)	O	
Columns	(0028,0011)	O	
Bits Stored	(0028,0101)	O	
Image Type	(0008,0008)	O	Multiple entry item
Image ID	(0054,0400)	O	

### 3.3 STUDY ROOT QUERY/RETRIEVE INFORMATION OBJECT DEFINITION

#### 3.3.1 Study Level Keys for Study Root Query/Retrieve Information Model

Attribute Name	Element Tag	Type	Notes
Revision: 17 (plus computed items)			
Patient Name	(0010,0010)	O	
Patient ID	(0010,0020)	O	

Patient Birth Date	(0010,0030)	O	
Patient Sex	(0010,0040)	O	
Study Instance UID	(0020,000D)	U	
Study Date	(0008,0020)	R	
Study Time	(0008,0030)	R	
Study ID	(0020,0010)	R	
Study Description	(0008,1030)	O	
Accession Number	(0008,0050)	O	
Referring Physician	(0009,0090)	O	
Patients Age	(0010,1010)	O	
Patients Weight	(0010,1030)	O	
Study Modality	(0008,0061)	O	Multiple entry item – automatically updated by server
Number of Study Related Series	(0020,1206)	O	Computed* - not database
Number of Study Related Instances	(0020,1208)	O	Computed* - not database

\*requires setting EnableComputedFields = 1 in dicom.ini

### **3.3.2 Series Level Keys for Study Root Query/Retrieve Information Model**

See Section 3.2.3

### **3.3.3 Image Level Keys for Study Root Query/Retrieve Information Model**

See Section 3.2.4

## **3.4 PATIENT/STUDY ONLY QUERY/RETRIEVE INFORMATION OBJECT DEFINITION**

### **3.4.1 Patient Level Keys for Patient/Study Only Query/Retrieve Information Model**

See Section 3.2.1

### **3.4.2 Study Level Keys for Patient/Study Only Query/Retrieve Information Model**

See Section 3.2.2

### 3.5 MODALITY WORKLIST QUERY INFORMATION OBJECT DEFINITION

#### 3.5.1 Keys for Modality Worklist Query Information Model

Attribute Name	Element Tag	Type	Notes
Revision: 17			
Accession Number	(0008,0050)	O	Primary Key
Patient ID	(0010,0020)	R	
Patient Name	(0010,0010)	R	
Patient Birth Date	(0010,0030)	O	
Patient Sex	(0010,0040)	O	
Medical Alerts	(0010,2000)	O	
Contrast Allergies	(0010,2110)	O	
Study Instance UID	(0020,000D)	O	
Requesting Physician	(0032,1032)	O	
Requested Procedure Description	(0032,1060)	O	
Requested Procedure Code Sequence	(0032,1064)	R	1 instances of this sequence required
>Modality	(0008,0060)	R	
>Requested contrast agent	(0032,1070)	O	
>Scheduled AE	(0040,0001)	R	
>Start date	(0040,0002)	R	
>Start time	(0040,0003)	R	
>Performing Physician	(0040,0006)	R	
>Scheduled Procedure Step Description	(0040,0007)	O	
>Scheduled Procedure Step ID	(0040,0009)	O	
>Scheduled Station Name	(0040,0010)	O	
>Scheduled Procedure Step Location	(0040,0011)	O	
>Premedication	(0040,0012)	O	
>Scheduled Procedure Step Comments	(0040,0400)	O	
Requested Procedure ID	(0040,1001)	O	
Requested Procedure Priority	(0040,1003)	O	
Character set	(0008,0005)	*	Returned as "ISO_IR 100" only when WorkListReturnsISO_IR_100 is set

To code this information into a database, the contents of the sequence are unfolded to the same level as the other fields. \*This field will be optionally returned whether requested or not